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PRELIMINARY REPORT
INDUSTRIAL WASTE STUDIES

MARLIN-ROCKWELL CORPORATION
PLAINVILLE, CONNECTICUT

BETZ

CONSULTANTS ON INDUSTRIAL WATER PROBLEMS

PRELIMINARY REPORT
INDUSTRIAL WASTE STUDIES

MARLIN-ROCKWELL CORPORATION
PLAINVILLE, CONNECTICUT

BETZ PROJECT #5711-W

JULY 25, 1958

SECTION I - GENERAL CONDITIONS AND PROBLEMS

Pursuant to your original authorization contained in Purchase Order No. 5449 dated March 21, 1957, an initial visit was made to your plant on May 9, 1957. At that time cursory examinations were made of your water system and the methods of handling and treatment of your industrial processing discharges. At that time verbal suggestions and recommendations were offered regarding the obtaining of specific data on flows, points of discharge, segregation and separation possibilities and many other phases of information required for preliminary studies. No report was submitted of our findings at that time and you proceeded to gather and assemble pertinent data for later use.

The initial and subsequent visits have revealed that you have two sources of water, including a connection with the public supply which is obtained from wells adjacent to your property and you have an intake in the brook or river running adjacent to your plant property from which you pump, treat and filter this water for various plant uses. The amounts of water used from each source vary considerably with the season and operation.

Sanitary sewage from your plant is directed to municipal sanitary sewers except from two relatively isolated points in your plant. Here septic tanks are provided for receiving the discharges.

Industrial processing wastes and waters are principally discharged to existing lagoons or ponds with inter-connections for draining relatively clean waters directly to the brook. A substantial amount of clean waters also enters these lagoons as does boiler blowdown discharges, oil contaminated condensates and yard drains.

During March of this year you advised our office that an alleged pollution charge was directed at your company by the private water company operating the public supply wells which are adjacent to your plant area. The alleged pollution was suspected to have originated from the waste lagoons and was diagnosed as synthetic detergents. Briefly, no attempt was made by your company to deny the charges due principally to the fact that the lagoons were located in relatively poor soil, synthetic detergents were used in your processing and circumstances pointed toward the existing condition. Meetings and conferences were held with various State and water company Authorities and the program outlined included discontinuing the use of synthetic detergents in your processing and ultimately treating the lagoon water for immediate discharge into the adjacent brook. These steps have been taken successfully at this writing.

Despite the fact that you had been employing your waste lagoons for many years and had been using synthetic detergents as an aid to metal cleaning for an extended period of time without influence on the public supply wells, in the writer's opinion the reason for this apparent condition was due to the excessive pumping of the wells during the last summer and fall season when ground water conditions were exceptionally low. This extraordinary pull or demand by the wells increased the cone of influence for taking water and consequently pulled portions of drainage from the waste ponds.

We have been subsequently advised that the concentration of detergent in the wells is gradually reducing. No tests have been made by our laboratory on the well waters.

Studies were again resumed in order to obtain sufficient information on the industrial waste flows for the development of a treatment and handling scheme which would be practical for implementation at your plant. During the interim of the initial visit by the writer, your staff had developed plans of existing pipe lines, points of discharge and a reasonable water balance. Water purchased from the public supply based on average use approximates 32,000 gpd. On the basis of records of pumping and treatment, it is apparent that somewhat in excess of 200,000 gpd of water is used from the brook or river.

A summary of water uses in the plant and the resulting discharge to waste shows that contaminated process wastes range from 12,000 gpd to 15,000 gpd. This does not include the oil contaminated condensate and boiler blowdown. These total over 30,000 gpd during most of the time. The actual calculated maximum blowdown for maximum boiler use is 4,000 gpd.

You report that the low pressure condensate is presently returned for re-use as boiler feedwater. Most of the time the high pressure condensate as well as that resulting from one of the hammers is discharged directly to the lagoon. The mixed high pressure condensate does pass through an oil separator. During certain times of the year part of this filtered condensate is returned for boiler feedwater.

It is the intent of this preliminary report to offer recommendations whereby your industrial discharges can be simply handled and treated and thereby minimize potential ground water contamination as well as unauthorized discharges to the adjacent brook or river. Most of the recommendations offered herein have been briefly discussed with your personnel to assure their practicability and that available space can be had.

SECTION II - DISCUSSION OF REQUIRED TREATMENT AND EQUIPMENT

The sources of the various contaminated wastes have been outlined in detail by your personnel and supplied to the writer. The estimated gallonage discharge and schedule was also supplied and from which calculations for required capacities have been made. Consequently, in this report the wastes will be grouped on the basis of the practicability of segregation and/or grouping for either discharge or treatment.

Appended to the report is a print of Drawing No. A-5711-W-2 entitled "Proposed Flow Diagram". This flow diagram represents our recommendations for segregation, handling and treatment.

The first phase that must be taken care of is the complete segregation of clean cooling water either for direct discharge to the storm sewers and hence to the brook or for re-use in other processes. Similarly, all storm water, roof drains and probably yard drains should be removed from their discharge to the existing lagoon and directed to the storm sewer and river.

At the present time the high volumes of condensate are presently discharged to the pond along with boiler blowdown. Most of the condensate is oil contaminated but otherwise satisfactory. Sampling of these discharges was particularly difficult and the samples collected are probably not truly representative of all conditions. However, during the early part of May we collected a sample of high pressure condensate as it enters the pond and a sample of the condensate from

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the hammer. These samples were collected when the boiler was not being blown down and consequently should be representative of conditions at that particular time. The analytical data obtained on these samples show that other than the oil content the condensate would be suitable for re-use. The sample of high pressure condensate which we understand has passed through an existing oil filter showed a residual oil content of 18.3 ppm. For discharge to the stream this would be an acceptable value, however, it would be considered relatively high for use back in the boiler. The sample obtained directly from the hammer discharge line showed 270 ppm of oil. This is exceptionally high and would not be permitted for discharge. The combined flows are calculated at a maximum of 30,000 gpd. The logical recommendation on this condensate would be the installation of appropriate type equipment for oil removal to a concentration whereby it could be used in the feedwater. For this service there are optional typesequipment available which include chemical coagulation and filtration by a recognized process and the filtration through a precoat filter. Since it has been indicated initially that reclamation of this condensate was rather unlikely at the present time, we have not evaluated the methods in detail and consequently no cost estimates are presented. Actually, we have been unable to obtain reliable flow measurements or reliable samples on which to base calculations and estimates.

As indicated previously, the condensate having only 18 ppm oil present would be satisfactory for discharge to the storm sewer. In all probability, the oil content may exceed this limit at times and consequently we believe that you should consider a relatively simple and inexpensive type filter or separator for the condensate. The effluent of this device should then be directed to the storm sewer for discharge to the river. Again, it is difficult to prepare a reliable estimate on the cost of preliminary filtration or separation since the actual flows are not known. It is apparent that the flow rate does not exceed 25 gpm on a continuous basis and consequently this could be used for calculation.

Probably the simplest and most economical type filter for reducing oil is a straw or excelsior type unit. This consists principally of a section in which straw or excelsior are deposited and through which the condensate must flow. When the material builds up to the extent that the water flow is restricted, then the filter media is pulled out, burned and replaced with new. The best set up on this type installation is to have duplicate units operating side by side and while one is being serviced the other one can handle the entire filtering load. This way relatively good operation and oil removal can be obtained.

There are mechanical oil filters as manufactured by Gale Oil Separator Company, Morse Filter Company, Josam Company and others. All of these have limitations and are relatively expensive as compared to the straw or excelsior type. We suggest that you investigate these directly with the manufacturers after you have changed or modified your piping and can obtain truly representative samples and flow rates.

We discussed briefly with your personnel the possibility of directing the condensate from the other hammer through the existing oil filter and obtain

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an effluent comparable to that shown by analysis of the mixed high pressure condensate. However, you indicated probably that this unit was now overloaded. In any event, we do suggest that this be investigated.

The processing waste to be handled as described by you and as outlined on the appended flow diagram include discharges from the cellar sump, the tumbling room, the etch house, the forge shop tumblers, washers and the laboratory. These mixed processing wastes contain high solids, some free oils and substantial qualities of water soluble oils. Part of the wastes have already been through filters and flotation separators and are discharged continuously as well as bulk dumps. The flow rate will be somewhat variable, however, it is apparent that if clean waters and condensates are separated, the flow of actual process wastes will not exceed 20,000 gpd.

The most difficult materials to remove from these mixed process wastes include the water soluble oils. As you will recall, substantial amounts of chemicals were required to obtain clarification in the waste as received in Pond #2 and ultimately Pond #1. In all probability, the wastes on which we made experimental treatment tests were somewhat more dilute than those to be expected following segregation. Therefore, it is imperative that as much pretreatment prior to coagulation be accomplished as is possible. On the appended flow diagram, you will note that we have indicated the process waste to be directed to a combination surge, settling and oil skimming tank. The detail of our suggestion for this receiving tank appears on the attached Drawing No. A-4711-W-1. The purpose of the tank is to permit the settling out of the heavier solids resulting from tumbling operations and others and the removal of free oil. Although these materials would not particularly interfere with subsequent treatment, it appears that the removal prior to pumping would be desirable. The suggested tankage as shown has a maximum working capacity of 3,000 gals. with a surge capacity of approximately 1600 gals. The continuous flight for skimming and solids removal can be operated intermittently or continuously as desired. We have indicated the tank of a shape that the solids will be scraped up the incline and into a dry receiver for deposition elsewhere.

The oil to be skimmed from the unit can be collected either automatically or through a manually controlled oil skimmer. This will permit intermittent pumpage to the proposed batch treatment tanks. The pump suction should be located at the effluent end of the tank oposite the influent and should be as near the surface of the low water level as is practical. The influent to the tank can be at any elevation desired and we have shown it at approximately low water level.

The exact size of this receiving tank is difficult to determine. As indicated, we have shown the tank at 3,000 gals. maximum capacity. Certainly there would be no criticism for having the tank of greater capacity. Also, suggested design is probably one of several that could be utilized satisfactorily for the service. No cost estimates are presented herewith although the tankage may be constructed of concrete or steel and the internal mechanical equipment furnished by Link-Belt Company, Chain Belt Company, Jeffrey Equipment and others. The writer will be pleased to discuss this proposed tankage with any of the manufacturers if you so desire and by so doing can obtain reliable estimates of cost.

As indicated previously, the solids removed from this unit can be transported either for dry fill or deposited in the sludge lagoon. The oil removed should be collected and deposited in the oil lagoon as shown on the proposed diagram.

No attempt has been made to size the pumps or pumping equipment carrying the surged wastes to the proposed batch treatment tanks. If the flow rates are as indicated by calculations, the pumping equipment will be relatively small. However, the exact size is not particularly critical as long as it is sufficient to keep ahead of the flow.

The anticipated maximum flow of 20,000 gpd is well within the limits for handling in a batch treatment plant. As indicated previously, the calculated flow ranges between 12,000 gpd and 15,000 gpd. We have suggested for your consideration the use of 20,000 gal. tanks. We believe the batch treatment tankshould be two in number each having sufficient capacity to handle one complete day's flow. This provides flexibility and if the flows substantially increase, a third tank can always be added.

The pump discharge handling wastes from the receiving tank should be directed to either one of the two proposed batch tanks. We request that you refer to the flow diagram for the general flow scheme. Also, on print of Drawing A-5711-W-3, we have shown a typical tank section. The materials of construction can be wood, steel or concrete. We have shown a combination wood stave tank with a concrete mat for support and shaped with hopper bottom. The tankage required for the working capacity of 20,000 gals. approximates 15' in diameter X 15' high. The tank is equipped with a paddle mixer complete with sludge scraper blades for ready removal of the sludge. You will note that we have shown multiple side outlets for decanting the clarified waste following treatment and settling. The inlet to the tank is optional and may be through the bottom, side or over the top.

The method of operation would be to pump from the surge tank until one of the batch tanks was filled. At which time a laboratory jar test could be made to determine the amount of chemicals required to clarify the waste. When this was determined, the chemicals could be mixed in a solution tank located adjacent to or on top of the batch tank, the solution prepared and discharged into the raw waste. Agitation and mixing for approximately one hour would be desirable following which the agitator would be stopped and several hours or overnight settling permitted. The clarified waste would then be decanted to the storm sewer and hence to the river. The accumulated sludge could be removed by opening the sludge valve and starting the agitator. This material would then flow to a proposed sludge lagoon as shown on the general flow diagram.

Normally when a two or more tank system is arranged, common outlet lines are employed. If steel or concrete tanks were used, the design would be rectangular or square in place of round. By this type tankage, common wall construction could be used.

The agitator equipment employed can be purchased from vendors of water works equipment or made especially for the intended use.

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It is not essential that these batch tanks be housed, however, in your area where severe cold weather is encountered, it would probably be desirable to consider rough housing.

Costs vary widely with the type of tankage, the size and other items including equipment that it was believed to be better that you decide on the equipment to be employed and then obtain firm estimates.

SECTION III - CONCLUSIONS AND RECOMMENDATIONS

In view of the foregoing discussions supplemented by our joint studies of substantial amounts of collected data, we can conclude that your actual industrial waste problem can be practically andeconomically handled provided appropriate measures are taken and operated. Our recommendations may be summarized and briefly discussed as follows:

1. It is essential that complete separation and segregation of all storm water and roof drains for discharge to the storm sewers be made. This also includes yard and street drains. However, it is necessary that certain good housekeeping practices be put into effect to avoid careless dumping of oil or other materials where they will eventually reach yard drains.
2. We also recommend that all clean cooling waters either be collected for re-use or directed for discharge to the storm sewer. They should be removed from discharging into any lagoon in order that the operating size or capacity of the lagoon can be kept at a minimum. Furthermore, if water can be re-used, lesser pumping and treatment costs will be experienced.

3. The blowdown from the boilers should be separated from the condensate. The blowdown must be discharged to the proposed sludge lagoon in order to obtain high solids separation. The alternate to this option would be to provide a separate receiving pond for boiler blowdown since this volume far exceeds the volume anticipated in the proposed sludge lagoon from the chemical treatment of the industrial wastes.

4. We recommend that you give consideration to the installation of primary equipment for removing oil from the condensate presently discharged to the lagoon. Depending on the degree of treatment installed, the condensate could be then either discharged to the storm sewer as satisfactorily treated waste water or directed back to the heater for re-use in the boilers. As pointed out previously, the effluent from the 4" line presently discharging to the lagoon had only 18 ppm oil which would be satisfactory for direct stream discharge. However, we are aware that this condensate has passed through an existing oil removal system. The other line directly from the hammer had oil far in excess of the permissible limit for direct stream discharge. Since we have no specific information on the existing oil removal equipment nor were you able to supply this information at the time of the field investigation, we believe it might be worthwhile to investigate these units to ascertain if they could

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be used at higher capacity for the primary treatment and include the direct discharge from the other hammer. If so, the installation of additional facilities for oil reduction in the condensate would not be necessary at this time. Analytically, it is apparent the existing equipment does not do a satisfactory job on the condensate for using it as boiler makeup. You advised that occasionally this high pressure condensate is used, however, we would anticipate unfavorable boiler operating conditions. We believe our suggestions and recommendations regarding separate handling of the condensate are obvious since this volume approximates 30,000 gpd which is in excess of the actual processing waste to be treated by methods later described. Also, if your present practices continued of discharging these wastes to a lagoon, it is necessary to substantially enlarge the lagoon to include this type waste. However, there actually is no danger of underground water pollution by discharging this type waste to a receiving pond.

5. It is apparent that you are practically completely sewered to the municipal sanitary sewer, however, we are aware that at least one septic tank overflow discharges to the lagoon. This should be connected to the municipal sewer. We believe you have in mind changing the location of the washroom in order to obtain a more practical connection.

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6. Based on discussions and information collected, it is apparently practical to group various process wastes as shown on the pr―――

flow diagram and direct these to a proposed receiving and surge tank also shown. This suggested tank design and capacity has been previously discussed in the report and the appended print contains some details. It is necessary that appropriate controls for water levels be installed. The pumping units to take suction from this receiving tank must be installed to operate intermittently or semi-continuous, based on discharge from processing.

7. To adequately treat the combined processing wastes, we recommend two batch treatment tanks, each having the capacity for one day's maximum flow. The suggested design and capacity have been previously discussed in this report and some of the details are shown on the appended print. It is essential that complete accessories and auxiliaries be provided for these units. We have shown a multiple valve take-off on the side, however, with modified mixing equipment internal to the tanks, a loose joint decanting mechanism could be installed internal to the tanks for discharge. Whatever type discharge is finally decided upon, there should be a receiving sump exterior to the tank for inspection and sampling.

8. Throughout the report we have discussed a sludge pond or lagoon for receiving the solids developed from chemical treatment of the process waste. This pond should be conveniently located to the batch treatment tank so that the sludge can be discharged by gravity. The exact size can be determined by space available and whether or

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not this particular pond or ponds are to receive the boiler blowdown. It may be desirable to install two smaller sludge lagoons for alternate use with one draining and drying while the other is in use. We presume you will proceed with filling your existing lagoons when you find it necessary to use the ground. Also, as previously mentioned, you may wish to retain a section of the old pond for receiving boiler blowdown or continuing to discharge oil contaminated condensate.

We are attaching certain analytical data on samples collected from the condensate as well as from the treated samples of #2 Lagoon wastes prior to river discharge.

This preliminary report together with the recommendations is offered to enable you to proceed with final plans for treating and handling your liquid discharges from processing and plant operation. We trust you will find the report clear and complete for the intended purpose. We appreciate the opportunity of extending these services to you and request that you feel free to contact the writer for further discussion as the plan develops. We express appreciation for the courtesies extended during these studies.

Respectfully submitted,

BETZ LABORATORIES, INC.

Max U. Priester

Max U. Priester
Associate Director
Consulting Division

MUP GM
cc: 4
enc.

water analyses

Marlin-Rockwell Corporation
Plainville, Connecticut

BETZ LABORATORIES, INC.
PHILADELPHIA 24, PA.

BETZ

sample dated:

	5/8/58	5/8/58	5/12/58	5/19/58		
MPLING POINT	High Pressure Condensate	Condensate Hammer	Treated 2nd Lagoon Waste Discharge	Treated #2 Lagoon		
ALYSIS NUMBER	F 140	141	142	139		
nonia N, ppm	.25	.2				
bon Dioxide CO_2, ppm	1	2				
l Hardness $CaCO_3$, ppm						
cium $CaCO_3$, ppm						
gnesium $CaCO_3$, ppm						
olphthalein linity as $CaCO_3$, ppm						
hyl Orange as $CaCO_3$, ppm						
O_4, ppm						
ride l, ppm						
a O_2, ppm						
l Phosphate O_4, ppm						
e' Phosphate O_4, ppm						
te O_3, ppm						
	8.15	6.82	7.38			
cific Conductance, omhos	23	22				
cific Conductance, omhos (corrected)	21	20				
spended olids, ppm			24			
ndets, ppm			7.0	5.0		
l and Grease, ppm		270				
ASTM, ppm	18.3					

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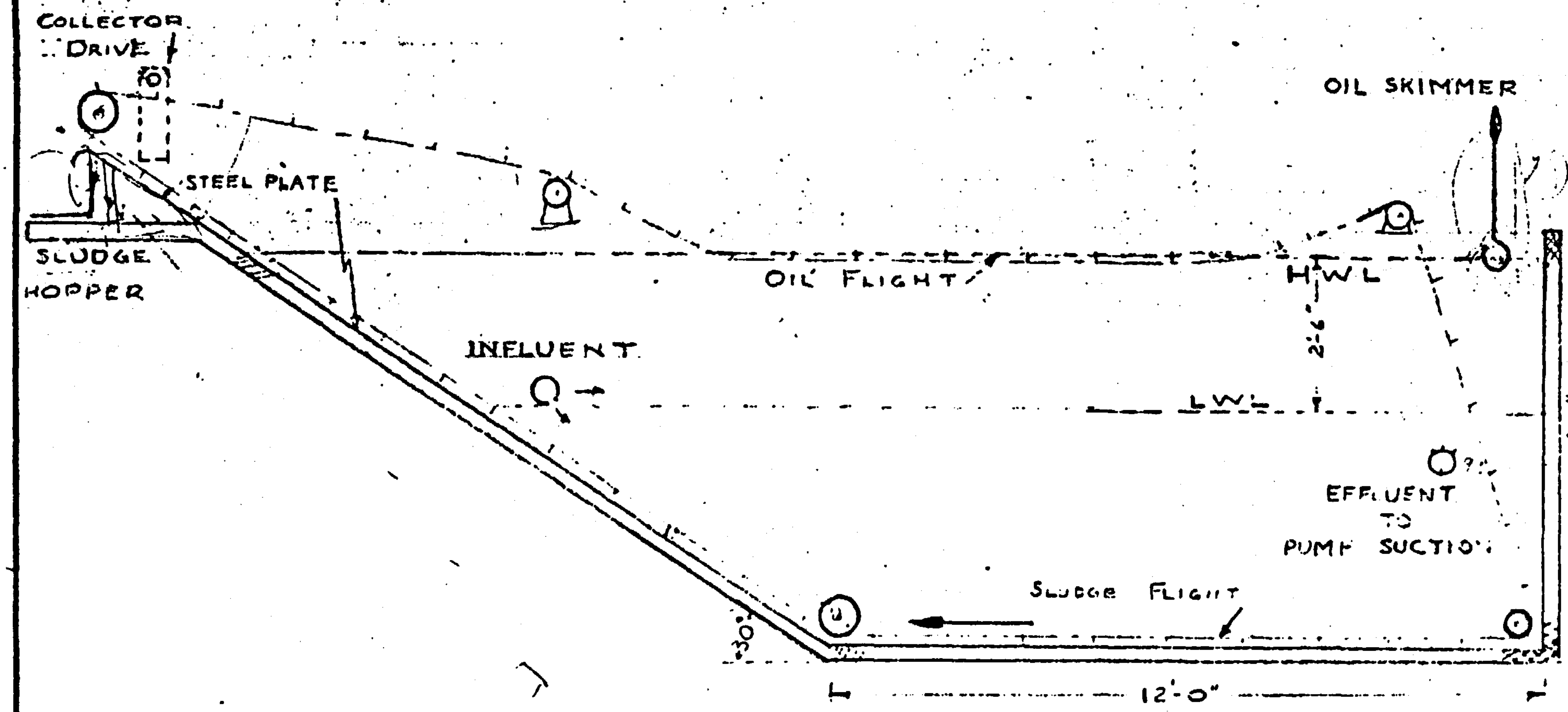
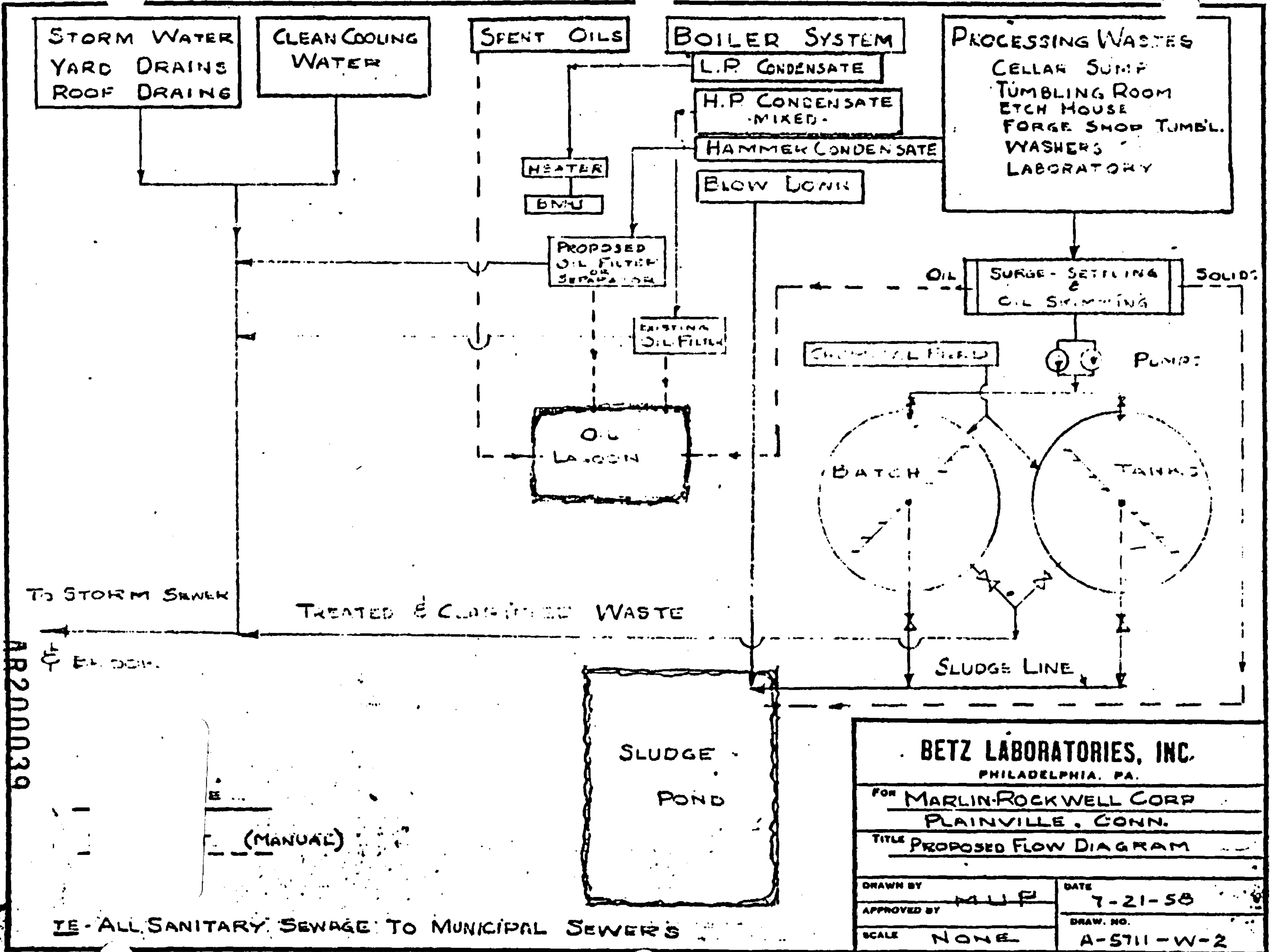


COMBINATION
SURGE- SETTLING
&
SKIMMING TANK

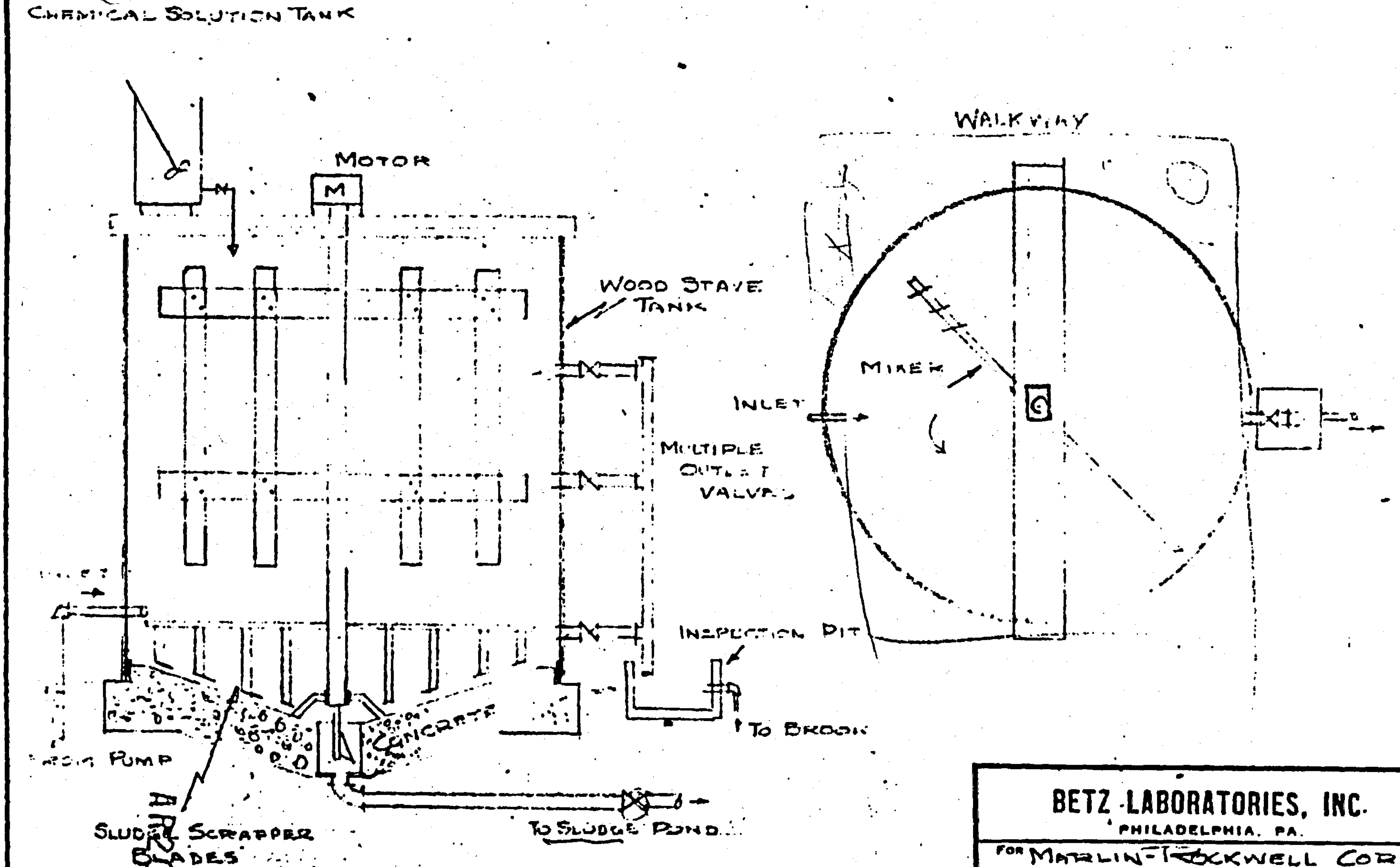
CAPACITY
HWL 3000 GAL.
LWL 1400 GAL.

BETZ LABORATORIES, INC. PHILADELPHIA, PA.	
FOR MARLIN-ROCKWELL CORP PLAINVILLE CONN.	
TITLE PROPOSED RECEIVING TANK INDUSTRIAL WASTES	
DRAWN BY	DATE 7-9-58
APPROVED BY MUD	DRAW. NO. A-5711-W-1
SCALE 3/8" = 1'	

AR200038


STORM WATER
YARD DRAINS
ROOF DRAINS
CLEAN COOLING WATER
SPENT OILS
BOILER SYSTEM
L.P. CONDENSATE
H.P. CONDENSATE -MIXED-
HAMMER CONDENSATE
BLOW DOWN
PROCESSING WASTES
CELLAR SUMP
TUMBLING ROOM
ETCH HOUSE
FORGE SHOP TUMBL.
WASHERS
LABORATORY
HEATER
PROPOSED OIL FILTER OR SEPARATOR
EXISTING OIL FILTER
OIL LAGOON
OIL
SURGE - SETTLING & OIL SKIMMING
SOLIDS
PUMPS
BATCH
TANKS
TO STORM SEWER
TREATED & WASTE
SLUDGE LINE
SLUDGE POND
(MANUAL)
TE - ALL SANITARY SEWAGE TO MUNICIPAL SEWERS
BETZ LABORATORIES, INC.
PHILADELPHIA, PA.
FOR MARLIN-ROCKWELL CORP
PLAINVILLE, CONN.
TITLE PROPOSED FLOW DIAGRAM
DRAWN BY
APPROVED BY
SCALE NONE
DATE 7-21-58
DRAW. NO. A-5711-W-2

AR200039



TANKAGE
15' DIAMETER - 15' STAVES
WORKING CAPACITY - 20000 GAL.
CONCRETE BASE - SLOPED. -
USE 2 TANKS -

BETZ LABORATORIES, INC.
PHILADELPHIA, PA.

FOR MARLIN-ROCKWELL CORP. PLAINVILLE, CONN	
TITLE SUGGESTED BATCH TANK DESIGN & ACCESSORIES	
DRAWN BY	DATE 7-21-58
APPROVED BY MUP	
SCALE NONE	DRAW. NO. A-5711-W-3